EMC Technologies Pty Ltd
ABN 82 057 105 549
57 Assembly Drive
Tullamarine Victoria Australia 3043

Ph: + 613 9335 3333
Fax: + 613 9338 9260
email: melb@emctech.com.au

EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart C (Section 15.247) & RSS-210

FCC ID:	EJE-WL0011
Industry Canada ID:	337J-WL0011
Test Sample:	XB62 Atheros Mini-PCI WLAN Module
Model:	AR5BXB6
Report Number:	M060223_Cert_AR5BXB6_DTS
Tested for:	Fujitsu Australia Ltd.
Issue Date:	3rd April 2006

NATA Accredited Laboratory Number:
5292

EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart C (Section 15.247) & RSS-210

EMC Technologies Report No. M060223_Cert_AR5BXB6_DTS

Issue Date: 3rd April 2006

CONTENTS

EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart C (Section 15.247) & RSS-210

Report Number: M060223_Cert_AR5BXB6_DTS

Test Sample: XB62 Mini-PCI WLAN Module
Model: AR5BXB6
Manufacturer: Atheros Communications

FCC ID: EJE-WL0011
Industry Canada ID: 337J-WL0011
Equipment Type: Intentional Radiator (Transceiver)

Host Notebook Manufacturer: Fujitsu Ltd.
Mobile Computing Division
Address: 1-1 Kamikodanaka 4-Chome, Nakahara-Ku, Kawasaki, Japan
Contact: Mr. Tsuyoshi Uchihara

Tested for: Fujitsu Australia Ltd

Test Standards: FCC Part 15, Subpart C – Intentional Radiators
FCC Part 15.247: 2400 – 2483.5 MHz & 5725 – 5850 MHz Operation Band
ANSI C63.4 – 2003
OET Bulletin No. 65

RSS-210 Issue 6 Low Power Licence-Exempt RadioCommunication Devices: 6.2.2 (o) 2400 – 2483.5 MHz & 5725 – 5850 MHz Spread Spectrum

RSS-102 Issue 1 (Provisional), Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields

Test Dates: 15th February to 30th March 2006

Test Officer: C Huynh
Chieu Huynh - B.Eng (Hons) Electronics

Attestation: *I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.*

Authorised Signatory: C. Zombolas
Chris Zombolas
Technical Director
EMC Technologies Pty Ltd

EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 15 Subpart C (Section 15.247) & RSS-210

1.0 INTRODUCTION

Testing was performed on the Atheros Mini-PCI Wireless LAN Module (XB62 11a+b/g), Model: AR5BXB6 installed in Fujitsu notebook PC.

The Atheros WLAN module was originally certified by Atheros as a modular approval under FCC ID: PPD-AR5BXB6-M (Canada ID: 4104A-AR5BXB6). The intention of this application is to get a Limited Modular approval for this WLAN module for use in Fujitsu notebook PCs. The Radio modules are installed in a controlled environment at the Fujitsu notebook production/assembly factory.

The Atheros WLAN supports IEEE 802.11b, IEEE 802.11g and IEEE802.11a (DTS & U-NII) configurations. Tests were performed in all three configurations.

The results for configurations IEEE 802.11b, IEEE 802.11g and IEEE802.11a (DTS: 5725 – 5850 MHz) are reported in this test report.

The results for IEEE 802.11a (U-NII) are reported separately.
Refer to EMC Technologies' test report: M060223_Cert_AR5BXB6_NII (U-NII)

The second transmitter in the notebook is a Bluetooth module, model: EYTF3CSFT. This Bluetooth module has been recently certified by Fujitsu Australia Ltd under the FCC ID: EJE-BT0001 (IC ID: 337J-BT0001).

Test results and procedures were performed in accordance with the following Federal Communications Commission (FCC) standards/regulations:

47 CFR, Part 15, Subpart C:	Rules for intentional radiators (particularly section 15.247)
Section 15.203:	Antenna requirements
Section 15.205:	Restricted bands of operation
Section 15.207:	Conducted Emission Limits
Section 15.209:	Radiated Emission Limits (General requirements)
Section 15.247:	Operation in the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz

The test sample **complied** with the requirements of 47 CFR, Part 15 Subpart C - Section 15.247.

The test sample also complied with the Industry Canada RSS-210 issue 6 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(o) and the RF exposure requirements of RSS-102.

1.1 Summary of Results

1.1.1 FCC Subpart C, Section 15.247

FCC Part 15, Subpart C Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.203	5.5	Antenna Requirement	**Not Applicable**
15.205	6.3	Operation in Restricted Band	**Complies**
15.207	6.6	Conducted Emissions	**Complies**
15.209	6.3	Radiated Emissions	**Complies**
15.247 (a)(2)	6.2.2(o)(iv)	Channel Bandwidth	**Complies**
15.247 (b)(3)	6.2.2(o)(b)	Peak Output Power	**Complies**
15.247 (i)		Radio Frequency Hazard	**Complies**
15.247 (d)	6.2.2(o)(e1)	Out of Band Emissions	**Complies**
15.247 (e)	6.2.2(o)(iv)	Peak Power Spectral Density	**Complies**

1.1.2 FCC Subpart E, Section 15.407

FCC Part 15, Subpart E Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.203	5.5	Antenna Requirement	**Not Applicable**
15.205	6.3	Operation in Restricted Band	**Complies**
15.207	6.6	Conducted Emissions	**Complies**
15.209	6.3	Radiated Emissions	**Complies**
15.407 (a)(1) (a)(2)	6.2.2(q1)	Peak Transmit Power	**Complies**
15.407 (a)(5)	6.2.2(q1)	Peak Power Spectral Density	**Complies**
15.407 (a)(6)		Peak Excursion	**Complies**
15.407 (b)	6.2.2(q1)	Undesirable Emission	**Complies**
15.407 (f)		Radio Frequency Hazard	**Complies**
15.407 (g)	6.4	Frequency Stability	**Complies**

Refer to EMC Technologies Report No: M060223_Cert_AR5BXB6_NII

The measurement procedure used was in accordance with ANSI C63.4-2003 and OET Bulletin No. 65. The instrumentation conformed to the requirements of ANSI C63.2-1996.

1.2 Modifications by EMC Technologies

No modifications were required.

2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 EUT (WLAN) Details

Transmitter:	Mini-Card Wireless LAN Module
Wireless Module:	XB62 (11a+b/g)
Model Number:	AR5BXB6
Manufacturer:	Atheros
Modulation Type:	Direct Sequence Spread Spectrum (DSSS for 802.11b) Orthogonal Frequency Division Multiplexing (OFDM for 802.11g) Orthogonal Frequency Division Multiplexing (OFDM for 802.11a)
802.11a and 802.11g	BPSK – 6Mbps, 9Mbps QPSK – 12Mbps, 18Mbps 16QAM – 24Mbps, 36Mbps 64QAM – 48Mbps, 54Mbps Turbo mode: 12 Mbps - 108 Mbps
802.11b	DBPSK – 1Mbps DQPSK – 2Mbps CCK – 5.5Mbps, 11Mbps
Frequency Range:	2.4 –2483.5 GHz for 11b/g 5.15 - 5.35 GHz, 5.47 – 5.725 GHz and 5.725 - 5.850 GHz for 11a
Antenna Types:	Refer antenna data provided separately
Antenna gain:	Refer antenna data provided separately
Power Supply:	3.3 VDC from PCI bus

Frequency Allocation Table:

Band	Channel	Lower Freq.	Upper Freq.	WWF1	WWF2	JPF4	KRF1
802.11b/g	1-11	2.412GHz	2.462GHz	X	X	X	X
802.11b/g	12-13	2.467GHz	2.472GHz		X	X	X
802.11a	36-48	5.150GHz	5.250GHz	X	X	X(Note1)	X
802.11a	52-64	5.250GHz	5.350GHz	X	X	X	X
802.11a	100-140	5.470GHz	5.725GHz	X	X		X
802.11a	149-165	5.725GHz	5.850GHz	X	X		X

Note 1: Odd channel support

Channels Tested and Output power setting:

Channel and Mode:	Output Power setting (average, dBm)
802.11b mode	
*Channel 1, 6 and 11	17 (1 Mbps to 11 Mbps)
802.11g mode	
*Channel 1, 6 and 11	16 (6 Mbps to 48 Mbps)
*Channel 1, 6 and 11	15 (54 Mbps)
802.11a mode	
**Channel 36, 52, 64, 100, 120 and 140	16 (6 Mbps to 36 Mbps)
**Channel 36, 52, 64, 100, 120 and 140	14 (48 Mbps)
**Channel 36, 52, 64, 100, 120 and 140	13 (54 Mbps)
*Channels 149, 152, 157, 160 and 165	16 (6 Mbps to 36 Mbps)
*Channels 149, 152, 157, 160 and 165	14 (48 Mbps)
*Channels 149, 152, 157, 160 and 165	11 (54 Mbps)

*Channels tested and reported in this report

**Channels tested and reported in the U-NII submission (M060223_Cert_AR5BXB6_NII)

2.2 Operational Description

The Atheros WLAN Module was individual tested in 3 Fujitsu host notebooks E8210, Q2010 and S7110 to cover two antenna types

The Atheros WLAN test software "CRTU" was used to transmit continuously during the tests. For Spurious and Harmonics tests both radio modules (WLAN and Bluetooth) were simultaneously transmitting.

2.3 Technical Specifications

Refer to Appendix G for details

2.4 Test Configuration

Conducted tests were performed at the WLAN Antenna ports.
Radiated tests were performed for measuring the harmonics and spurious from the transmitters.

Limited Modular Approval (LMA) details to cover the following Fujitsu notebook configurations:

Fujitsu Notebook Model	WLAN Module	WLAN Antenna	Comments
E8210	Atheros XB62	2 x Inverted F antenna	Results are reported
Q2010		2 x Inverted F antenna	Results are reported
S7110		2 x Monopole Antenna	Results are reported
E8110		2 x Inverted F antenna	Results are cover under other Notebook models. Refer to antenna table below.
S6310		2 x Inverted F antenna	

Fujitsu Notebook Model	WLAN antenna type	WLAN antenna Peak gain [dBi]			
		2.4GHz band	5GHz low band	5GHz Mid band	5GHz High band
E8110	Inverted F	-0.99	-1.12	-0.56	-0.56
E8210	Inverted F	2.47	-0.44	0.38	0.38
S7110	Monopole	2.08	1.66	0.59	1.79
Q2010	Inverted F	2.32	3.23	3.36	1.48
S6310	Inverted F	-0.38	1.09	0.64	0.90

2.5 Host PC Details

2.5.1 S7110 Model Notebook

Host notebook :	LifeBook S series
Model Name:	S7110 / S7110D
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Yonah-DC 2.16GHz
LCD	14”SXGA+ / 14”XGA
Wired LAN:	Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: AM3(New)
Port Replicator Model:	FPCPR63
AC Adapter Model:	80W: SEB100P2-19.0(Sanken) / SQ2N80W19P-01(Nagano) 64W: SED80N2-19.0(Sanken)
Voltage:	19 V
Current Specs:	4.22A, 3.37A
Watts:	80W, 64W
RADIO MODULES	
Module # 1	WLAN (XB62 IEEE802.11a+b/g)
WLAN Model No.:	AR5BXB6
WLAN Manufacturer:	Atheros
Interface Type:	Mini-Card Wireless LAN Module
Antenna Type:	Monopole Antenna - Model: YCE-5008 Located on top edge of LCD screen (Left and Right)
Antenna gain:	Refer to antenna data provided separately (Appendix F)
Module # 2:	Bluetooth Module
Model Number:	EYTF3CSFT
Manufacturer:	TAIYO YUDEN
Interface Type:	USB
Antenna Types:	Yokowo Inverted F Antenna, Model: YCE-5250 Location: Under Left side of the Shift key, above the air vent
Antenna gain:	2.78 dBi
Max. Output Power:	4 dBm

2.5.2 E8110 Model Notebook

Host notebook :	LifeBook E series
Model Name:	E8110 / E8110D
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Yonah-DC 2.16GHz
LCD	15”SXGA+ / 15”XGA
Wired LAN:	Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: AM3(New)
Port Replicator Model:	FPCPR63
AC Adapter Model:	SEB100P2-19.0(Sanken) / SQ2N80W19P-01(Nagano JRC)
Voltage:	19 V
Current Specs:	4.22A
Watts:	80W
RADIO MODULES	
Module # 1:	WLAN (XB62 IEEE802.11a+b/g)
WLAN Model Number:	AR5BXB6
WLAN Manufacturer:	Atheros
Interface Type:	Mini-Card Wireless LAN Module
Antenna Types:	Nissei Electric Inverted F Antenna - Model: CP115429(Left), CP115429(Right) Located on top edge of LCD screen (Left and Right)
Antenna gain:	Refer to antenna data provided separately (Appendix F)
Module # 2:	Bluetooth Module
Model Number:	EYTF3CSFT
Manufacturer:	TAIYO YUDEN
Interface Type:	USB
Antenna Types:	Yokowo Inverted F Antenna, Model: YCE-5250 Location: Under Left side of the Shift key, above the air vent
Antenna gain:	-0.22 dBi
Max. Output Power:	4 dBm

2.5.3 E8210 Model Notebook

Host notebook :	LifeBook E series
Model Name:	E8210 / E8210D
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Yonah-DC 2.16GHz
LCD	15”WUXGA / 15”WSXGA+ / 15”WXGA
Wired LAN:	Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: AM3(New)
Port Replicator Model:	FPCPR63
AC Adapter Model:	SEB100P2-19.0(Sanken) / SQ2N80W19P-01(Nagano JRC)
Voltage:	19 V
Current Specs:	4.22A
Watts:	80W
RADIO MODULES	
Module # 1:	WLAN (XB62 IEEE802.11a+b/g)
WLAN Model Number:	AR5BXB6
WLAN Manufacturer:	Atheros
Interface Type:	Mini-Card Wireless LAN Module
Antenna Types:	Nissei Electric Inverted F Antenna Model: CP115431(Left), CP115431(Right) Located on top edge of LCD screen
Antenna gain:	Refer antenna data provided separately (Appendix F)
Module # 2:	Bluetooth Module
Model Number:	EYTF3CS FT
Manufacturer:	TAIYO YUDEN
Interface Type:	USB
Antenna Types:	Yokowo Inverted F Antenna, Model: YCE-5250 Location: Under Left side of the Shift key, above the air vent
Antenna gain:	-0.22 dBi
Max. Output Power:	4 dBm

2.5.4 Q2010 Model Notebook

Host notebook :	LifeBook Q series
Model Name:	Q2010
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Yonah-SC(ULV) 1.2GHz
LCD	12”WXGA
Wired LAN:	Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T
Modem:	None
Port Replicator Model:	FPCPR64
AC Adapter Model:	SEC80N2-16.0(Sanken)
Voltage:	16 V
Current Specs:	3.75A
Watts:	60W
RADIO MODULES	
Module # 1:	WLAN (XB62 IEEE802.11a+b/g)
WLAN Model Number:	AR5BXB6
WLAN Manufacturer:	Atheros
Interface Type:	Mini-Card Wireless LAN Module
Antenna Types:	Nissei Electric Inverted F Antenna Model: CP115426(Left), CP115435(Right) Located on top edge of LCD screen
Antenna gain:	Refer antenna data provided separately (Appendix F)
Module # 2:	Bluetooth Module
Model Number:	EYTF3CS FT
Manufacturer:	TAIYO YUDEN
Interface Type:	USB
Antenna Types:	Nissei Electric Inverted F Antenna, Model: CP115428 Location: Right side of the [Back Space] key, above the connector
Antenna gain:	3.27 dBi
Max. Output Power:	4 dBm

2.5.5 S6310 Model Notebook

Host notebook :	LifeBook S series
Model Name:	S6310
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Yonah-DC 2.16GHz
LCD	13.3"XGA
Wired LAN:	Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: D40
Port Replicator Model:	FPCPR63
AC Adapter Model:	80W: SEC100P2-19.0(Sanken) / SQ2N80W19P-01(Nagano JRC) 64W: SED80N2-19.0(Sanken)
Voltage:	19 V
Current Specs:	4.22A, 3.37A
Watts:	80W, 64W
RADIO MODULES	
Module # 1:	WLAN (XB62 IEEE802.11a+b/g)
WLAN Model Number:	AR5BXB6
WLAN Manufacturer:	Atheros
Interface Type:	Mini-Card Wireless LAN Module
Antenna Types:	Nissei Electric Inverted F Antenna Model: CP115441(Left), CP115440(Right) Located on top edge of LCD screen
Antenna gain:	Refer antenna data provided separately (Appendix F)
Module # 2:	Bluetooth Module
Model Number:	EYTF3CS FT
Manufacturer:	TAIYO YUDEN
Interface Type:	USB
Antenna Types:	Yokowo Inverted F Antenna, Model: YCE-5250 Location: Right side of media card slot
Antenna gain:	0.38 dBi
Max. Output Power:	4 dBm

2.6 Block Diagram

Refer to Appendix D - Block Diagram

2.7 Support Equipment

Refer to Attachment 3 – FCC Part 15B Test Report (Report: FG06-041EAL)

2.8 Test Procedure

Emissions measurements were performed in accordance with the procedures of ANSI C63.4-2003. Radiated emissions tests were performed at a distance of 1 and 3 metres from the EUT. OET Bulletin 65 dated June 2001 was used for reference.

2.9 Test Facility

2.9.1 General

Radiated Emission measurements were performed at EMC Technologies open area test site (OATS) situated at Lerderderg Gorge, near the township of Bacchus Marsh in Victoria, Australia. Conducted measurements at an antenna ports were performed at EMC Technologies' laboratory in Tullamarine, Victoria Australia.

The above test sites have been accepted for testing by the Federal Communications Commission (FCC) - **FCC Registration Number 90560**.
EMC Technologies open area test site (OATS) has also been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS 212, Issue 1 (Provisional).
Industry Canada File Number IC 4161.

2.9.2 NATA Accreditation

EMC Technologies is accredited in Australia to test to the following standards by the National Association of Testing Authorities (NATA).

"FCC Part 15 unintentional and intentional emitters in the frequency range 9kHz to 18 GHz excluding TV receivers (15.117 and 15.119), TV interface devices (15.115), cable ready consumer electronic equipment (15.118), cable locating equipment (15.213) and unlicensed national information infrastructure devices (Sub part E)."

The current full scope of accreditation can be found on the NATA website: www.nata.asn.au
It also includes a large number of emission, immunity, SAR, EMR and Safety standards.

NATA is the Australian national laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Laboratory (NML) and an internal quality system to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A^2LA).

2.10 Test Equipment Calibration

All measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Agilent Technologies (Australia) Pty Ltd or the National Measurement Laboratory (NML). All equipment calibration is traceable to Australia national standards at the National Measurements Laboratory. The reference antenna calibration was performed by NML and the working antennas (biconical and log-periodic) calibrated by the NATA approved procedures. The complete list of test equipment used for the measurements, including calibration dates and traceability is contained in Appendix A

2.11 Ambients at OATS

The Open Area Test Site (OATS) is an area of low background ambient signals. No significant broadband ambients are present however commercial radio and TV signals exceed the limit in the FM radio, VHF and UHF television bands. Radiated prescan measurements were performed in the shielded enclosure to check for possible radiated emissions at the frequencies where the OATS ambient signals exceeded the test limit.

RESULTS
WLAN Module – AR5BXB6 (802.11b, 802.11g and 802.11a (DTS))

3.0 CONDUCTED EMISSION MEASUREMENTS

Testing was performed in accordance with the requirements of FCC Part 15.207
Refer to Attachment 3 – FCC Part 15B Test Report (Report: FG06-041EAL)

4.0 SPURIOUS EMISSION MEASUREMENTS

4.1 Test Procedure

Testing was performed in accordance with the requirements of FCC Part 15.247(d).

Radiated emission measurements were performed to the limits as per section 15.209. The measurements were made at the open area test site.

The EUT was set up on the table top (placed on turntable) of total height 80 cm above the ground plane, and operated as described in section 2 of this report. The EMI Receiver was operated under software control via the PC Controller through the IEEE.488 Interface Bus Card Adaptor. The test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of possible EMI peaks while also permitting fast frequency scan times. Calibrated EMCO 3115, EMCO 3116 and ETS standard gain horn antennas were used for measurements between 1 to 40 GHz.

The measurement of emissions between 30 - 1000 MHz, refer to Attachment 3 – FCC Part 15B Test Report (Report: FG06-041EAL).

The measurement of emissions above 1000 MHz, appearing in the restricted bands, was made using an average detector with a bandwidth of 1.0 MHz.

The EUT was slowly rotated with the Peak Detector set to Max-Hold. This was performed for two antenna heights. When an emission was located, it was positively identified and its maximum level found by rotating the automated turntable, and by varying the antenna height. Each significant peak was investigated with the Quasi-Peak/Average Detectors. The software for cable losses automatically corrected the measurement data for each frequency range, antenna factors and preamplifier gain and all data was then stored on disk in sequential data files. This process was performed for both horizontal and vertical antenna polarisations.

4.2 Calculation of field strength

The field strength was calculated automatically by the software using all the pre-stored calibration data. The method of calculation is shown below:

E = V + AF - G + L Where:
E = Radiated Field Strength in dBμV/m.
V = EMI Receiver Voltage in dBμV. (measured value)
AF = Antenna Factor in dB(m^{-1}). (stored as a data array)
G = Preamplifier Gain in dB. (stored as a data array)
L = Cable loss in dB. (stored as a data array of Insertion Loss versus frequency)

- **Example Field Strength Calculation**

Assuming a receiver reading of 34.0 dBμV is obtained at 90 MHz, the Antenna Factor at that frequency is 9.2 dB. The cable loss is 1.9 dB while the preamplifier gain is 20 dB. The resulting Field Strength is therefore as follows:

34.0 + 9.2 + 1.9 - 20 = 25.1 dBμV/m

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (1000 MHz – 18,000 MHz) ± 4.1 dB

4.3 Radiated Emissions (Spurious and Harmonics)

4.3.1 Frequency Band: 1 – 40 GHz

All measurements above 1 GHz were initially made over a distance of 3 metres. This was decreased to 1.0 metre as the emission levels from the device were very low.

The 54 dBμV/m limit at 3 metres has been converted to 64 dBμV/m at 1 metre using a factor of 20 dB per decade where emissions were located in the restricted bands.

Measurements were performed on 3 Fujitsu host notebooks E8210, Q2010 and S7110 and all test results are reported.

Testing was performed while both the WLAN transmitter and Bluetooth transmitter continuously operated. Harmonics related to the WLAN transmitter (2.4 – 2.4835 GHz and 5.725 – 5.850 GHz) is reported below. Harmonics in the frequency band (5.15 – 5.35 GHz and 5.47 – 5.725 GHz), refer to M060223_Cert_AR5BXB6_NII.

4.3.1.1 Configuration 802.11b

Initial investigations were performed with three modulation types: (DBPSK, DQPSK and CCK). Emissions with CCK modulation were observed to be slightly worst. Final testing was performed while the transmitter continuously operated with the modulation rate of 11 Mbps (CCK).

The EUT was operating at its highest channel (2462 MHz), the field strength at 2483.5 MHz was:
55.5 dBμV/m peak and 42.6 dBμV/m average (E8210 LifeBook).
53.7 dBμV/m peak and 41.2 dBμV/m average (Q2010 LifeBook)
56.3 dBμV/m peak and 44.8 dBμV/m average (S7110 LifeBook)
The levels were > 20 dB below the maximum field strength of the in-band carrier.

The EUT was operating at its lowest channel (2412 MHz), the field strength at 2400 MHz was:
69.9 dBμV/m peak and 55.3 dBμV/m average (E8210 LifeBook).
68.3 dBμV/m peak and 53.8 dBμV/m average (Q2010 LifeBook)
68.4 dBμV/m peak and 56.2 dBμV/m average (S7110 LifeBook)
The levels were > 20 dB below the maximum field strength of the in-band carrier.

Channel 1 - 2412 MHz

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
2412	**111.5**	**100.2**	**110.6**	**100.4**	**110.1**	**99.6**	-	-	-
4824	**56.4**	**46.1**	**53.4**	**41.7**	**52.7**	**41.9**	74.0	54.0	Pass
7236	46	35	**55.5**	**45.9**	**48.6**	**37.3**	-	-	-
9648	49	38	49	38	49	38	-	-	-
12060	53	41	53	41	53	41	74.0	54.0	Pass
14472	57	45	57	45	57	45	74.0	54.0	Pass
16884	56	45	56	45	56	45	-	-	-
19296	65	52	65	52	65	52	84.0*	64.0*	Pass
21708	69	56	69	56	69	56	-	-	-
24120	69	56	69	56	69	56	-	-	-
2396	**67.5**	**55.7**	**67.3**	**55.5**	**66.7**	**55.4**	-	-	-
2427	**66.2**	**55.5**	**68.1**	**56.8**	**65.2**	**54.1**	-	-	-
2386	**56.8**	**45.3**	**57.2**	**46.4**	**52.6**	**43.0**	74.0	54.0	Pass
3216	**-**	**-**	**43.8**	**34.6**	**45.3**	**37.7**	-	-	-

*Limits were corrected for 1 metre measurement.

Channel 6 - 2437 MHz

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
2437	**112.2**	**101.7**	**109.0**	**99.3**	**111.8**	**101.4**	-	-	-
4874	**54.6**	**45.8**	**52.2**	**40.0**	**53.5**	**42.7**	74.0	54.0	Pass
7311	46	35	**53.6**	**43.4**	**50.1**	**38.6**	74.0	54.0	Pass
9748	49	38	49	38	49	38	-	-	-
12185	53	41	53	41	53	41	74.0	54.0	Pass
14622	57	45	57	45	57	45	-	-	-
17059	56	45	56	45	56	45	-	-	-
19496	65	52	65	52	65	52	84.0*	64.0*	Pass
21933	69	56	69	56	69	56	-	-	-
24370	69	56	69	56	69	56	-	-	-
2452	**66.8**	**56.0**	**65.4**	**55.1**	**68.4**	**57.9**	-	-	-
2422	**65.5**	**55.6**	**63.8**	**53.2**	**65.7**	**54.3**	-	-	-
2411	**52.2**	**44.0**	**-**	**-**	**58.6**	**47.5**	-	-	-
3249	**-**	**-**	**43.1**	**32.7**	**45.0**	**36.2**	-	-	-

*Limits were corrected for 1 metre measurement.

Channel 11 - 2462 MHz

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
2462	**110.6**	**101.3**	**109.7**	**99.4**	**112.3**	**101.5**	-	-	-
4924	**55.7**	**46.5**	**54.5**	**42.1**	**53.0**	**42.4**	74.0	54.0	Pass
7386	46	35	**52.3**	**41.8**	**52.7**	**41.2**	74.0	54.0	Pass
9848	49	38	49	38	49	38	-	-	-
12310	53	41	53	41	53	41	74.0	54.0	Pass
14772	57	45	57	45	57	45	-	-	-
17234	56	45	56	45	56	45	-	-	-
19696	65	52	65	52	65	52	84.0*	64.0*	Pass
22158	69	56	69	56	69	56	84.0*	64.0*	Pass
24620	69	56	69	56	69	56	-	-	-
2448	**67.1**	**55.9**	**63.9**	**53.3**	**68.2**	**55.6**	-	-	-
2476	**65.8**	**55.8**	**64.2**	**55.4**	**69.9**	**56.4**	-	-	-
2488	**54.4**	**47.3**	**56.7**	**46.1**	**57.3**	**47.0**	74.0	54.0	Pass
3283	**-**	**-**	**44.2**	**33.6**	**44.4**	**35.1**	-	-	-

*Limits were corrected for 1 metre measurement.

Result: Harmonic and spurious emissions were recorded within the restricted bands of up to 25 GHz. Other harmonics were confirmed low with both RBW and VBW reduced (the peak and average levels listed in the above tables were noise floor readings). The worst case harmonics were complied with the FCC limits in sections 15.209 and 15.247 by a margin of 6.7 dB. The measurement uncertainty for radiated emissions in this band was ±4.1 dB.

4.3.1.2 Configuration 802.11g

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). Emissions with 64QAM modulation were observed to be slightly worst. Final testing was performed while the transmitter continuously operated with the modulation rate of 48 Mbps (normal mode) and 96 Mbps (turbo mode).

The EUT was operating at its highest channel (2462 MHz), the field strength at 2483.5 MHz was:
71.0 dBμV/m peak and 53.7 dBμV/m average (E8210 LifeBook).
69.7 dBμV/m peak and 52.6 dBμV/m average (Q2010 LifeBook)
68.1 dBμV/m peak and 53.0 dBμV/m average (S7110 LifeBook)
The levels were > 20 dB below the maximum field strength of the in-band carrier.

The EUT was operating at its lowest channel (2412 MHz), the field strength at 2400 MHz was:
85.8 dBμV/m peak and 68.2 dBμV/m average (E8210 LifeBook).
84.1 dBμV/m peak and 66.6 dBμV/m average (Q2010 LifeBook)
81.2 dBμV/m peak and 63.5 dBμV/m average (S7110 LifeBook)
The levels were > 20 dB below the maximum field strength of the in-band carrier.

Channel 1 - 2412 MHz

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
2412	**108.2**	**98.1**	**109.7**	**98.5**	**109.5**	**98.4**	-	-	-
4824	**53.1**	**41.4**	**50.2**	**38.1**	**50.8**	**38.3**	74.0	54.0	Pass
7236	46	35	**55.0**	**43.6**	**48.1**	**37.7**	-	-	-
9648	49	38	49	38	49	38	-	-	-
12060	53	41	53	41	53	41	74.0	54.0	Pass
14472	57	45	57	45	57	45	74.0	54.0	Pass
16884	56	45	56	45	56	45	-	-	-
19296	65	52	65	52	65	52	84.0*	64.0*	Pass
21708	69	56	69	56	69	56	-	-	-
24120	69	56	69	56	69	56	-	-	-
2390	**67.7**	**52.6**	**68.3**	**52.7**	**69.2**	**53.0**	74.0	54.0	Pass
2360	**60.7**	**48.3**	**-**	**-**	**-**	**-**	74.0	54.0	Pass
2288	**56.2**	**45.8**	**-**	**-**	**54.6**	**45.0**	74.0	54.0	Pass
3216	**-**	**-**	**45.1**	**37.8**	**44.3**	**35.7**	-	-	-

*Limits were corrected for 1 metre measurement.

Channel 6 - 2437 MHz

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
2437	**108.0**	**97.8**	**108.4**	**97.7**	**109.1**	**98.2**	-	-	-
4874	**52.7**	**42.9**	**50.1**	**38.1**	**51.4**	**38.6**	74.0	54.0	Pass
7311	46	35	**53.5**	**42.4**	**49.1**	**38.5**	74.0	54.0	Pass
9748	49	38	49	38	49	38	-	-	-
12185	53	41	53	41	53	41	74.0	54.0	Pass
14622	57	45	57	45	57	45	-	-	-
17059	56	45	56	45	56	45	-	-	-
19496	65	52	65	52	65	52	84.0*	64.0*	Pass
21933	69	56	69	56	69	56	-	-	-
24370	69	56	69	56	69	56	-	-	-
2288	**55.7**	**45.7**	**-**	**-**	**54.0**	**44.7**	74.0	54.0	Pass
3249	**-**	**-**	**44.3**	**36.5**	**44.1**	**35.0**	-	-	-

*Limits were corrected for 1 metre measurement.

Channel 11 - 2462 MHz

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
2462	**108.1**	**97.6**	**109.0**	**98.2**	**109.8**	**98.9**	-	-	-
4924	**51.1**	**41.3**	**49.5**	**38.0**	**51.0**	**38.6**	74.0	54.0	Pass
7386	46	35	**53.4**	**42.6**	**51.2**	**40.7**	74.0	54.0	Pass
9848	49	38	49	38	49	38	-	-	-
12310	53	41	53	41	53	41	74.0	54.0	Pass
14772	57	45	57	45	57	45	-	-	-
17234	56	45	56	45	56	45	-	-	-
19696	65	52	65	52	65	52	84.0*	64.0*	Pass
22158	69	56	69	56	69	56	84.0*	64.0*	Pass
24620	69	56	69	56	69	56	-	-	-
2483.5	**71.0**	**53.7**	**69.7**	**52.6**	**68.1**	**53.0**	74.0	54.0	Pass
2288	**54.1**	**45.0**	**-**	**-**	**53.3**	**43.8**	74.0	54.0	Pass
3283	**-**	**-**	**45.7**	**38.0**	**43.3**	**34.7**	-	-	-

*Limits were corrected for 1 metre measurement.

Channel 6 - 2437 MHz – Turbo Mode

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
2437	**107.3**	**96.3**	**105.8**	**94.3**	**106.2**	**95.4**	-	-	-
4874	**50.3**	**41.2**	**49.5**	**38.0**	**47.1**	**36.6**	74.0	54.0	Pass
7311	46	35	**53.4**	**42.6**	**47.4**	**37.1**	74.0	54.0	Pass
9748	49	38	49	38	49	38	-	-	-
12185	53	41	53	41	53	41	74.0	54.0	Pass
14622	57	45	57	45	57	45	-	-	-
17059	56	45	56	45	56	45	-	-	-
19496	65	52	65	52	65	52	84.0*	64.0*	Pass
21933	69	56	69	56	69	56	-	-	-
24370	69	56	69	56	69	56	-	-	-
2288	**53.9**	**44.5**	**-**	**-**	**51.0**	**42.3**	74.0	54.0	Pass
3249	**-**	**-**	**42.7**	**35.1**	**43.2**	**34.8**	-	-	-

*Limits were corrected for 1 metre measurement

Result: Harmonic and spurious emissions were recorded within the restricted bands of up to 25 GHz. Other harmonics were confirmed low with both RBW and VBW reduced (the peak and average levels listed in the above tables were noise floor readings). The worst case harmonics were complied with the FCC limits in sections 15.209 and 15.247 by a margin of 0.3 dB. The measurement uncertainty for radiated emissions in this band was ±4.1 dB.

4.3.1.3 Configuration 802.11a (5.725 – 5.850 MHz)

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). Emissions with 16QAM modulation were observed to be slightly worst. Final testing was performed while the transmitter continuously operated with the modulation rate of 24 Mbps (normal mode) and 48 Mbps (turbo mode).

Normal Mode:

The EUT was operating at its highest channel (5825 MHz), the field strength at 5850 MHz was:
68.6 dBμV/m peak and 53.3 dBμV/m average (E8210 LifeBook).
64.8 dBμV/m peak and 51.7 dBμV/m average (Q2010 LifeBook)
65.9 dBμV/m peak and 52.0 dBμV/m average (S7110 LifeBook)
The levels were > 20 dB below the maximum field strength of the in-band carrier.

The EUT was operating at its lowest channel (5745 MHz), the field strength at 5725 MHz was:
73.5 dBμV/m peak and 55.9 dBμV/m average (E8210 LifeBook).
69.9 dBμV/m peak and 53.5 dBμV/m average (Q2010 LifeBook)
72.8 dBμV/m peak and 56.2 dBμV/m average (S7110 LifeBook)
The levels were > 20 dB below the maximum field strength of the in-band carrier.

Turbo Mode:

The EUT was operating at its highest channel (5800 MHz), the field strength at 5850 MHz was:
67.0 dBμV/m peak and 52.1 dBμV/m average (E8210 LifeBook).
62.9 dBμV/m peak and 50.6 dBμV/m average (Q2010 LifeBook)
64.3 dBμV/m peak and 50.8 dBμV/m average (S7110 LifeBook)
The levels were > 20 dB below the maximum field strength of the in-band carrier.

The EUT was operating at its lowest channel (5760 MHz), the field strength at 5725 MHz was:
72.3 dBμV/m peak and 54.7 dBμV/m average (E8210 LifeBook).
65.8 dBμV/m peak and 52.8 dBμV/m average (Q2010 LifeBook)
71.7 dBμV/m peak and 55.8 dBμV/m average (S7110 LifeBook)
The levels were > 20 dB below the maximum field strength of the in-band carrier

Channel 149 - 5745 MHz

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
5745	**106.9**	**96.3**	**104.7**	**94.7**	**107.8**	**96.7**	-	-	-
11490	**56.3**	**45.8**	**53.3**	**40.9**	**58.2**	**46.5**	74.0	54.0	Pass
17235	56	43	56	43	56	43	-	-	-
22980	69	56	69	56	69	56	84.0*	64.0*	Pass
28725	79	67	79	67	79	67	-	-	-
34470	80	68	80	68	80	68	-	-	-
5440	**53.1**	**46.2**	**51.6**	**44.2**	**52.4**	**42.2**	74.0	54.0	Pass
3830	**-**	**-**	**49.4**	**40.3**	**-**	**-**	74.0	54.0	Pass

*Limits were corrected for 1 metre measurement.

Channel 157 - 5785 MHz

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
5785	**107.2**	**97.5**	**105.3**	**94.9**	**107.6**	**97.4**	-	-	-
11570	**55.7**	**45.0**	**53.4**	**41.5**	**58.3**	**46.8**	74.0	54.0	Pass
17355	56	43	56	43	56	43	-	-	-
23140	69	56	69	56	69	56	-	-	-
28925	79	67	79	67	79	67	-	-	-
34710	80	68	80	68	80	68	-	-	-
5440	**53.6**	**46.3**	**51.7**	**44.0**	**52.0**	**41.5**	74.0	54.0	Pass
3856.7	**-**	**-**	**50.3**	**40.8**	**-**	**-**	74.0	54.0	Pass

Channel 165 - 5825 MHz

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
5825	**108.4**	**98.7**	**106.4**	**95.7**	**107.0**	**97.1**	-	-	-
11650	**56.1**	**45.2**	**53.7**	**41.4**	**56.7**	**45.5**	74.0	54.0	Pass
17475	56	43	56	43	56	43	-	-	-
23300	69	56	69	56	69	56	-	-	-
29125	79	67	79	67	79	67	-	-	-
34950	80	68	80	68	80	68	-	-	-
5440	**52.8**	**46.0**	**52.4**	**42.7**	**51.3**	**41.1**	74.0	54.0	Pass
3883.3	**-**	**-**	**51.3**	**41.5**	**46.3**	**34.8**	74.0	54.0	Pass

Channel 152 - 5760 MHz – Turbo Mode

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
5760	**105.5**	**94.2**	**103.6**	**92.7**	**104.5**	**94.0**	-	-	-
11520	**54.8**	**44.6**	**53.3**	**41.0**	**55.8**	**45.0**	74.0	54.0	Pass
17280	56	43	56	43	56	43	-	-	-
23040	69	56	69	56	69	56	84.0*	64.0*	Pass
28800	79	67	79	67	79	67	-	-	-
34560	80	68	80	68	80	68	-	-	-
5440	**53.9**	**46.6**	**52.0**	**41.3**	**49.4**	**39.2**	74.0	54.0	Pass
3840	**-**	**-**	**51.1**	**40.8**	**-**	**-**	74.0	54.0	Pass

*Limits were corrected for 1 metre measurement.

Channel 160 - 5800 MHz – Turbo Mode

Frequency MHz	E8210 LifeBook Level (dBuV/m)		Q2010 LifeBook Level (dBuV/m)		S7110 LifeBook Level (dBuV/m)		Peak Limit dBuV/m	Average Limit dBuV/m	Result
	Peak Detector	Average Detector	Peak Detector	Average Detector	Peak Detector	Average Detector			
5800	**105.8**	**94.2**	**102.8**	**91.8**	**104.9**	**94.2**	-	-	-
11600	**55.3**	**44.7**	**53.1**	**40.4**	**55.1**	**44.3**	74.0	54.0	Pass
17400	56	43	56	43	56	43	-	-	-
23200	69	56	69	56	69	56	-	-	-
29000	79	67	79	67	79	67	-	-	-
34800	80	68	80	68	80	68	-	-	-
5440	**53.0**	**44.8**	**51.3**	**41.0**	**49.0**	**39.3**	74.0	54.0	Pass
3867	**-**	**-**	**50.5**	**40.9**	**-**	**-**	74.0	54.0	Pass

Result: Harmonics and spurious emissions were recorded within the restricted bands of up to 40 GHz. Harmonics were low and confirmed with both RBW and VBW reduced (the peak and average levels listed in the above tables were noise floor readings). Emissions were complied with the FCC limits in section 15.209 and 15.247 by a margin of 7.2 dB. The measurement uncertainty for radiated emissions in this band was ±4.1 dB.

4.3.2 Frequency Band: 30 - 1000 MHz

Refer to Attachment 3 – FCC Part 15B Test Report (Report: FG06-041EAL).

4.3.3 RF Conducted Measurements at the Antenna Terminal

In the 100 kHz bandwidth within the operating band, the highest emissions (spurious/harmonics) level that is produced by the intentional radiator shall be at least 20 dB below.

The transmitter output was connected to the spectrum analyser in peak hold mode.

The resolution bandwidth of 300 kHz and the video bandwidth of 300 kHz were utilised.

D1 line indicates the 20 dB limit below the highest level of the transmitter

Results: Complies.

Configuration 802.11a (5.725 – 5.850 GHz)
Refer to Appendix K1 for Harmonics plots

Configuration 802.11b
Refer to Appendix K2 for Harmonics plots

Configuration 802.11g
Refer to Appendix K3 for Harmonics plots

4.3.4 Band Edge Measurements

In the 100 kHz bandwidth within the operating band, the highest emissions (spurious/harmonics) level that is produced by the intentional radiator shall be at least 20 dB below.

The transmitter output was connected to the spectrum analyser in peak hold mode.

The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised.

Configuration 802.11a (5.725 – 5.850 GHz)
Refer to Appendix L1 for Band Edge plots

Configuration 802.11b

BE Frequency (MHz) within the restricted band	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2390	59.6	45.9	74.0	54.0	Pass
2483.5	62.2	50.1	74.0	54.0	Pass

Refer to Appendix L2 for Band Edge plots

Configuration 802.11g

BE Frequency (MHz) within the restricted band	Peak Detector dBuV	Average Detector dBuV	Peak Limit dBuV/m	Average Limit dBuV/m	Result
2390	63.7	50.6	74.0	54.0	Pass
2483.5	65.4	51.1	74.0	54.0	Pass

Refer to Appendix L3 for Band Edge plots

Results: Complies.

5.0 PEAK OUTPUT POWER - Section 15.247 (b)(3)

Testing was performed in accordance with the requirements of FCC Part 15.247(b)(3).

Measurements were performed while the WLAN transmitter continuously transmitted.

The peak output power measurement was performed using the integration method as per test method # 3 of DA 02-2138. The resolution bandwidth of 1 MHz was used. The video bandwidth (VBW) of 30 kHz was used.

VBW $\geq$ 1/T, where T (worst case) = 180 μS at 108 Mbps for 802.11a and 802.11g.
= 360 μS at 54 Mbps for 802.11a and 802.11g.
= 1890 μS at 11 Mbps for 802.11b.

Variation by +/- 15% of the supply voltage, in accordance with Section 15.31(e), to the computer power supply did not vary the output power observed.

5.1 Configuration 802.11a

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). Peak output power with 16QAM modulation was observed to be slightly worst. Final testing was performed while the transmitter continuously operated with the modulation rate of 24 Mbps (normal mode) and 48 Mbps (turbo mode).

Frequency MHz	Operating Mode	Power dBm	Limit dBm	Power mW	Limit mW	Result
5745	Normal	17.4	30	55.0	1000	Complies
5760	Turbo	17.2	30	52.5	1000	Complies
5785	Normal	17.2	30	52.5	1000	Complies
5800	Turbo	17.1	30	51.3	1000	Complies
5825	Normal	16.9	30	49.0	1000	Complies

5.2 Configuration 802.11b

Initial investigations were performed with three modulation types: (DBPSK, DQPSK and CCK). Power with CCK modulation (rate = 11 Mbps) was observed to be slightly worst. Final testing was performed while the transmitter continuously operating with the modulation rate of 11 Mbps (CCK).

Frequency MHz	Operating Mode	Power dBm	Limit dBm	Power mW	Limit mW	Result
2412	Normal	17.3	30	53.7	1000	Complies
2437	Normal	17.7	30	58.9	1000	Complies
2462	Normal	18.0	30	63.1	1000	Complies

5.3 Configuration 802.11g

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). Peak output power with 64QAM modulation was observed to be slightly worst. Final testing was performed while the transmitter continuously operated with the modulation rate of 48 Mbps (normal mode) and 96 Mbps (turbo mode).

Frequency MHz	Operating Mode	Power dBm	Limit dBm	Power mW	Limit mW	Result
2412	Normal	14.3	30	26.9	1000	Complies
2437	Normal	14.1	30	25.7	1000	Complies
2437	Turbo	14.5	30	28.2	1000	Complies
2462	Normal	14.8	30	30.2	1000	Complies

6.0 CHANNEL BANDWIDTH

Testing was performed in accordance with the requirements of FCC Part 15.247(a)(2)

In the bands 2400 - 2483.5 MHz and 5725 - 5850 MHz, the minimum 6 dB bandwidth was at least 500 kHz. The 6 dB bandwidth was measured while the transmitter continuously transmitted.

The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised

The minimum 6 dB bandwidth is at least 500 kHz

6.1 Configuration 802.11a

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). No significant differences in bandwidth were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 54 Mbps (normal mode) and 108 Mbps (turbo mode).

Frequency MHz	Operating Mode	Bandwidth MHz	Result	6 dB Bandwidth Plots
5745	Normal	16.6	Complies	Appendix J1
5760	Turbo	33.1	Complies	Appendix J1
5785	Normal	16.6	Complies	Appendix J1
5800	Turbo	33.1	Complies	Appendix J1
5825	Normal	16.6	Complies	Appendix J1

6.2 Configuration 802.11b

Initial investigations were performed with three modulation types: (DBPSK, DQPSK and CCK). No significant differences in bandwidth were observed. Final testing was performed while the transmitter continuously operating with the modulation rate of 11 Mbps (CCK).

Frequency MHz	Operating Mode	Bandwidth MHz	Result	6 dB Bandwidth Plots
2412.0	Normal	11.5	Complies	Appendix J2
2437.0	Normal	11.3	Complies	Appendix J2
2462.0	Normal	11.2	Complies	Appendix J2

6.3 Configuration 802.11g

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM).). No significant differences in bandwidth were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 54 Mbps (normal mode) and 108 Mbps (turbo mode).

Frequency MHz	Operating Mode	Bandwidth MHz	Result	6 dB Bandwidth Plots
2412	Normal	16.6	Complies	Appendix J3
2437	Normal	16.6	Complies	Appendix J3
2437	Turbo	33.0	Complies	Appendix J3
2462	Normal	16.6	Complies	Appendix J3

7.0 PEAK POWER SPECTRAL DENSITY - Section 15.247(e)

Testing was performed accordance with the requirements of FCC Part 15.247(e)

The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

The resolution bandwidth of 3 kHz and the video bandwidth of 30 kHz were utilised

The specification limit is 8 dBm in any 3 kHz band during a continuous transmission.

7.1 Configuration 802.11a

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). Peak power spectral density with BPSK modulation was observed to be slightly worst. Final testing was performed while the transmitter continuously operated with the modulation rate of 6 Mbps (normal mode) and 12 Mbps (turbo mode).

Frequency MHz	Operating Mode	Level dBm	Limit dBm	Result	Spectral Density plots
5745	Normal	-8.5	8.0	Complies	Appendix M1
5760	Turbo	-11.5	8.0	Complies	Appendix M1
5785	Normal	-8.2	8.0	Complies	Appendix M1
5800	Turbo	-8.1	8.0	Complies	Appendix M1
5825	Normal	-8.6	8.0	Complies	Appendix M1

7.2 Configuration 802.11b

Initial investigations were performed with three modulation types: (DBPSK, DQPSK and CCK). Peak power spectral density with CCK modulation (rate = 11 Mbps) was observed to be slightly worst. Final testing was performed while the transmitter continuously operating with the modulation rate of 11 Mbps (CCK).

Frequency MHz	Operating Mode	Level dBm	Limit dBm	Result	Spectral Density plots
2412.0	Normal	-3.2	8.0	Complies	Appendix M2
2437.0	Normal	-4.5	8.0	Complies	Appendix M2
2462.0	Normal	-2.6	8.0	Complies	Appendix M2

7.3 Configuration 802.11g

Initial investigations were performed with four modulation types: (BPSK, QPSK, 16QAM and 64QAM). No significant differences in peak power spectral density were observed. Final testing was performed while the transmitter continuously operated with the modulation rate of 54 Mbps (normal mode) and 108 Mbps (turbo mode).

Frequency MHz	Operating Mode	Level dBm	Limit dBm	Result	Spectral Density plots
2412.0	Normal	-5.0	8.0	Complies	Appendix M3
2437.0	Normal	-1.6	8.0	Complies	Appendix M3
2437.0	Turbo	-6.3	8.0	Complies	Appendix M3
2462.0	Normal	-1.1	8.0	Complies	Appendix M3

8.0 RADIO FREQUENCY EXPOSURE (HAZARD) INFORMATION

Testing was performed in accordance with the requirements of FCC Part 15.247(i)

Spread spectrum transmitters operating in the 2400 - 2483.5 MHz and 5725 – 5850 MHz bands are required to be operated in a manner that ensures that the public is not exposed to RF energy levels in accordance with CFR 47, Section 1.1307(b)(1).

Transmitter # 1: The WLAN antennas are located on the top edge of LCD screen (2 antennas left and right) and projected distance of greater than 20cm from user.

Transmitter # 2: The Bluetooth antenna is located under the keyboard and projected distance of less than 20cm from user.

SAR is not required as the WLAN transmitter is mobile device and the power for the Bluetooth transmitter is below the low threshold.

The separation distance between the WLAN and BT antennas is greater than 20cm. Therefore, they are not co-located transmitters.

The MPE calculation shown below is for the WLAN power densities.

In accordance with Section 1.1310, the Maximum Permissible Exposure (MPE) limit for the General Population/Uncontrolled Exposure of 1.0 has been applied, i.e 1mW/cm^2.

Friis transmission formula: $Pd = (P*G) / (4*\pi*r^2)$

where: Pd = power density (mW/cm^2)
P = power input to the antenna (mW)
G = antenna gain (numeric)
r = distance to the center of radiation of the antenna (cm)

The result was extracted from section 5.0 of this report (WLAN Module):
Prediction frequency = **5745 MHz**
Maximum peak output power = 17.4 dBm = 55.0 mW
Antenna (Monopole) gain (max) = 1.79 dBi = 1.51 numeric
The power density calculated = 0.017 mW/cm^2

Prediction frequency = **2462 MHz**
Maximum peak output power = 18.0 dBm = 63.1 mW
Antenna (Inverted F) gain (max) = 2.47 dBi = 1.77 numeric
The power density calculated = 0.022 mW/cm^2

MPE limit for uncontrolled exposure at prediction frequency = 1 mW/cm^2

Results: Calculations show that the Radio devices with described antennas complied with Maximum Permissible Exposure (MPE) limit for the General Population/Uncontrolled Exposure

9. 0 ANTENNA REQUIREMENT

Testing to the requirements of FCC Part 15.203 was not applicable as this intentional radiator was designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

10.0 COMPLIANCE STATEMENT

The Atheros Mini-PCI Wireless LAN Module (XB62 11a+b/g), Model: AR5BXB6 installed in Fujitsu notebook PCs tested on behalf of Fujitsu Australia Ltd, **comply** with the requirements of 47 CFR, Part 15 Subpart C - Rules for Radio Frequency Devices (intentional radiators), Section 15.247 - Operation in the frequency band 2400 - 2483.5 MHz and 5725 – 5850 MHz.

The test sample also complies with the Industry Canada RSS-210 issue 6 (Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands)) clause 6.2.2(o) 2400 – 2483.5 MHz Spread Spectrum requirements and the RF exposure requirements of RSS-102.

Results were as follows:

FCC Subpart C, Section 15.247

FCC Part 15, Subpart C Clauses	Industry Canada RSS-210 Clauses	Test Performed	Result
15.203	5.5	Antenna Requirement	**Not Applicable**
15.205	6.3	Operation in Restricted Band	**Complies**
15.207	6.6	Conducted Emissions	**Complies**
15.209	6.3	Radiated Emissions	**Complies**
15.247 (a)(2)	6.2.2(o)(iv)	Channel Bandwidth	**Complies**
15.247 (b)(3)	6.2.2(o)(b)	Peak Output Power	**Complies**
15.247 (i)		Radio Frequency Hazard	**Complies**
15.247 (d)	6.2.2(o)(e1)	Out of Band Emissions	**Complies**
15.247 (e)	6.2.2(o)(iv)	Peak Power Spectral Density	**Complies**

The results for IEEE 802.11a (U-NII) is reported separately.
Refer to EMC Technologies' test report: M060223_Cert_AR5BXB6_NII (U-NII)

TEST REPORT APPENDICES

APPENDIX A: MEASUREMENT INSTRUMENT DETAILS
APPENDIX B: REPORT PHOTOGRAPHS
APPENDIX C: FUNCTIONAL DESCRIPTION
APPENDIX D: BLOCK DIAGRAM
APPENDIX E: SCHEMATICS
APPENDIX F: ANTENNA INFORMATION
APPENDIX G: SPECIFICATIONS
APPENDIX H: FCC LABELLING DETAILS
APPENDIX I: USER MANUAL
APPENDIX J: CHANNEL BANDWIDTH PLOTS
APPENDIX K: HARMONICS PLOTS
APPENDIX L: BANDEDGE PLOTS
APPENDIX M: PEAK POWER SPECTRAL DENSITY PLOTS

Attachment 1: RF Exposure Information
Attachment 2: FCC DOC for Fujitsu Notebooks
Attachment 3: FCC Part 15B Test Report (Report: FG06-041EAL)